Ann & Robert H. Lurie Children's Hospital of Chicago®

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Standardizing point-of-care instrumentation:

One Institution's Experience

Brenda Suh-Lailam, PhD, DABCC, FACB
Ann & Robert H. Lurie Children's Hospital of Chicago
Feinberg School of Medicine, Northwestern University

BEST CHILDREN'S HOSPITALS U.S.News & WORLD REPORT HONOR ROLL 2016-17

THE LEAPFROG GROUP TOP CHILDREN'S HOSPITAL 2015

MAGNET RECOGNIZED AMERICAN NURSES CREDENTIALING CENTER

Learning Objectives

At the completion of this session, participants will be able to:

1. Describe the process of standardizing point-of-care instrumentation
2. List the challenges associated with standardizing point-of-care instrumentation
3. Discuss advantages of standardizing point-of-care instrumentation

Speaker Financial Disclosure Information

- **Grant/Research Support:** None
- **Salary/Consultant Fees:** None
- **Board/Committee/Advisory Board Membership:** None
- **Stocks/Bonds:** None
- **Honorarium/Expenses:** None
- **Intellectual Property/Royalty Income:** None

Point-of-Care Testing is Advantageous

Fast

- Quick turnaround time = faster clinical decision-making
- Supports efficient workflow

Portable

- Can be taken where needed
- Increase global access to care

Affordable

- Infrastructure costs are minimal
- Fewer steps involved

Reliable

- Results are comparable to lab
- No regular servicing required

Do you have different device types for the same test at your institution?

A. Yes, for multiple tests
B. Yes, only for one test
C. No

Different Device Types – Same Test

Blood gas analysis

- Handheld
- Benchtop type 1
- Benchtop type 2
- Benchtop type 3

ACT testing

- Handheld type 1
- Handheld type 2
- Benchtop

Challenges - Multiple Device Types – Same Test

- May confound the interpretation of the status of the patient
  - Anticoagulation status – ACT
  - Need for transfusion – Hemoglobin

- Decreased efficiency of operators and POC staff
  - Different processes, steps and workflows – decreased compliance
  - Maintaining inventory for different device types
    - QC, calibration verification materials
  - Performing instrument to instrument comparisons
  - Keeping procedures updated

- Increased operating costs
  - Having to interface each device type
  - Low order volumes
  - Maintenance fees for each device type

Advantages - Why Standardize?

Improve efficiency

- Creating uniformity in practice
- Reduced learning curves
- Reduced changes

Improve quality

- Improved test utilization
- Decrease in pre-analytic errors
- Increase regulatory compliance
- Increased patient safety

Cost savings

- Personnel (more efficient workflows)
- Decreased supply expenses – price reduction
- Decreased maintenance and data management costs

Should we standardize our POC instrumentation?

A. Yes, absolutely
B. No, let sleeping dogs lie

What challenges do you foresee?

- Change management
- Data collection
- Cost of acquiring new instrumentation

What challenges do you foresee?

- Change management
  - Choosing an instrument that meets the needs of every area
    - Getting everyone to agree on one instrument
  - Personnel learning to use new instrumentation
  - Identification of all stakeholders

Two POCT Instrumentation Standardization Projects

- Blood gas analysis
  - Goal: 4 $\rightarrow$ 1
- ACT testing
  - Goal: 3 $\rightarrow$ 1

Case Study:

Blood gas analysis

Blood Gas Analyzer	Location
Handheld	Anesthesia/OR
	MRI
	ED/ Observation
	Transport
	PICU
Benchtop 1	CICU
	NICU
	PICU
Benchtop 2	Cath Lab
Benchtop 3	CVS

In the Beginning, Data and Ground Work

American Productivity & Quality Center (APQC) Blog
"For Change Management To Work The Reason Must Be Compelling"
Rachele Collins, May 30, 2017

- Outlined issues identified
- Data collection
  - Compiled non-compliance and error data
  - Existing cost and potential savings info from manufacturers
  - Determined test volumes
- Alerted hospital compliance officer
  - Risks associated with status quo
- Identified and talked individually to stakeholders

Key Steps in Standardizing POCT Instrumentation

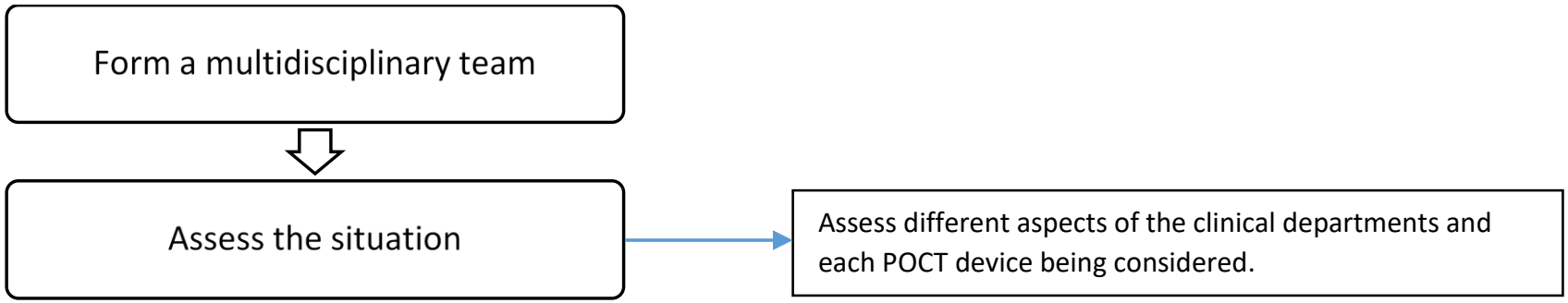
Form a multidisciplinary team

https://www.aacc.org/publications/cln/articles/2017/november/from-many-one-a-case-study-on-standardizing-point-of-care-testing-instrumentation

Who did we include in a multidisciplinary team?

- key decision makers from all affected areas
  - Providers
  - Directors/managers
    - Nursing directors
    - Respiratory therapy director
  - Instrument operators
    - Clinical educators
    - Nurses
    - Respiratory therapists
    - Technicians

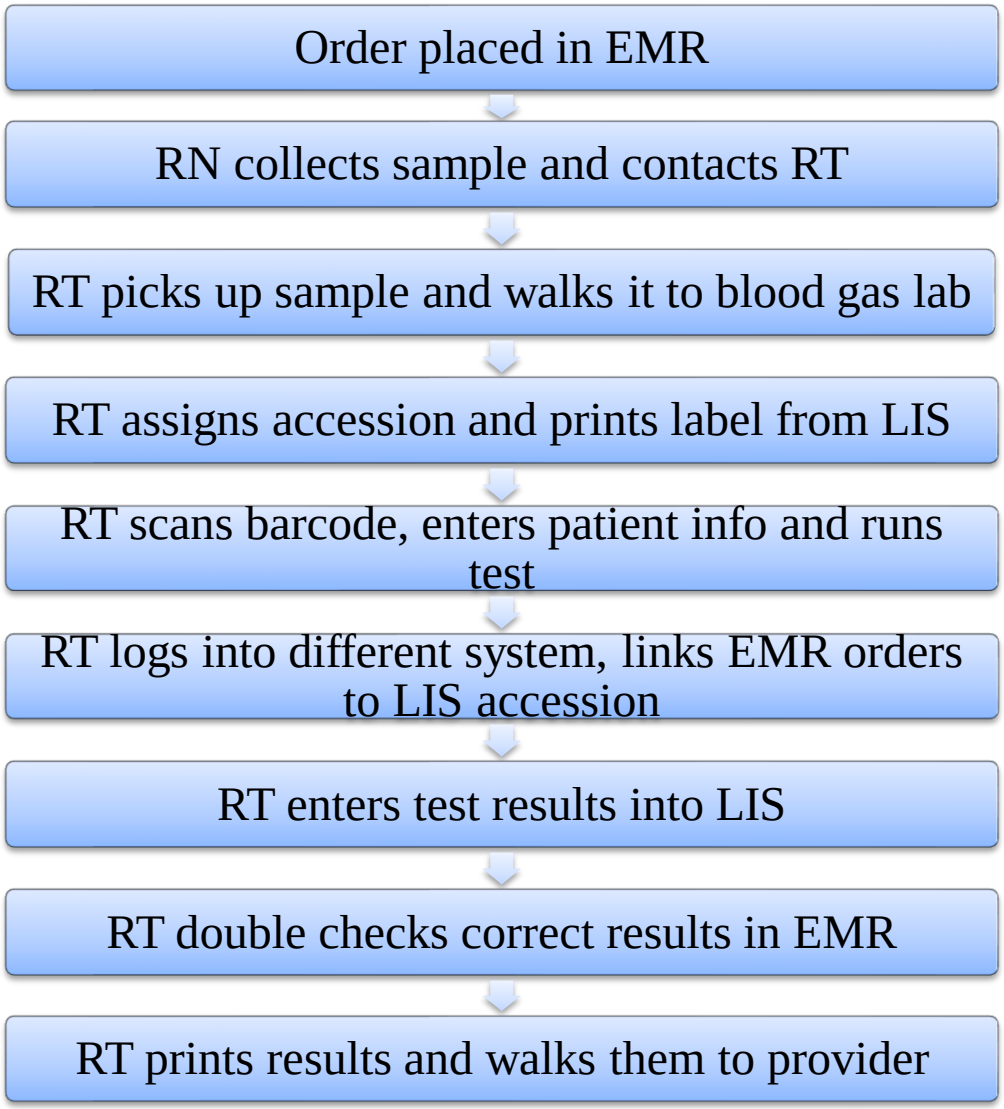
Key Steps in Standardizing POCT Instrumentation



What did we assess?

- Clinical need
- Workflows
- Current regulatory compliance/quality
- Test utilization
- Test volumes
- Cost
- Ease of use
- Available infrastructure to support use of instrument
- Analytical performance

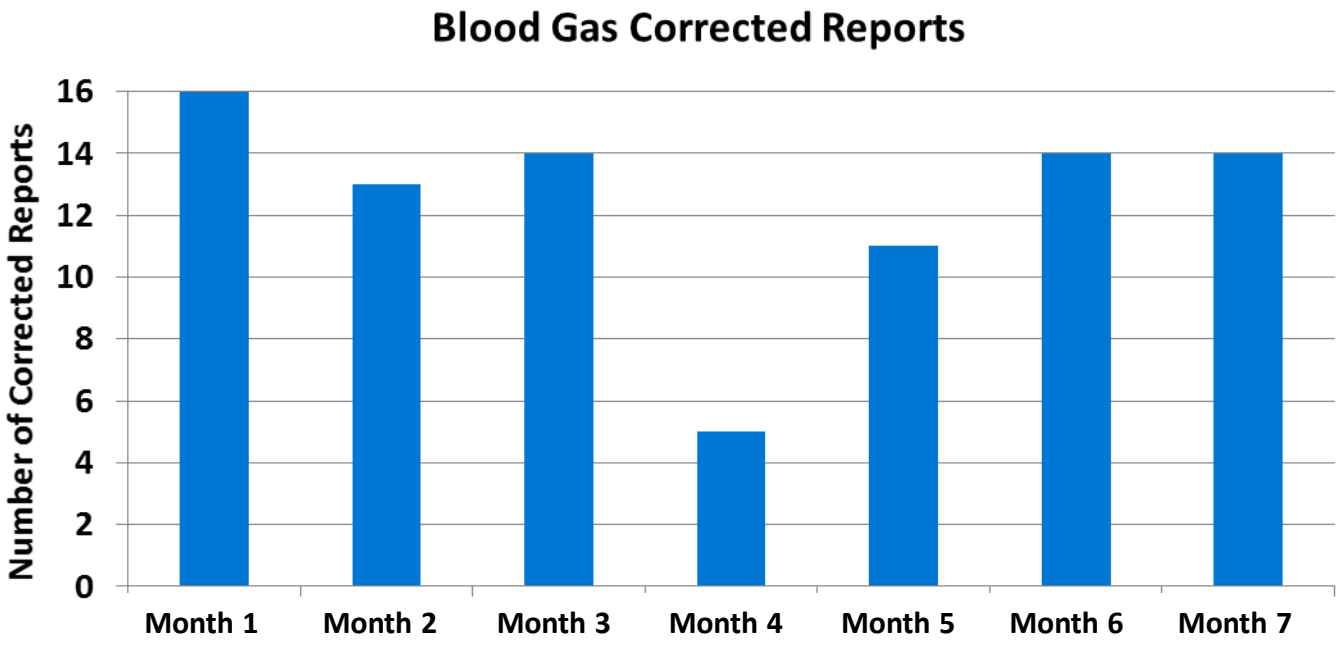
Assessment of workflows – Respiratory therapy workflow



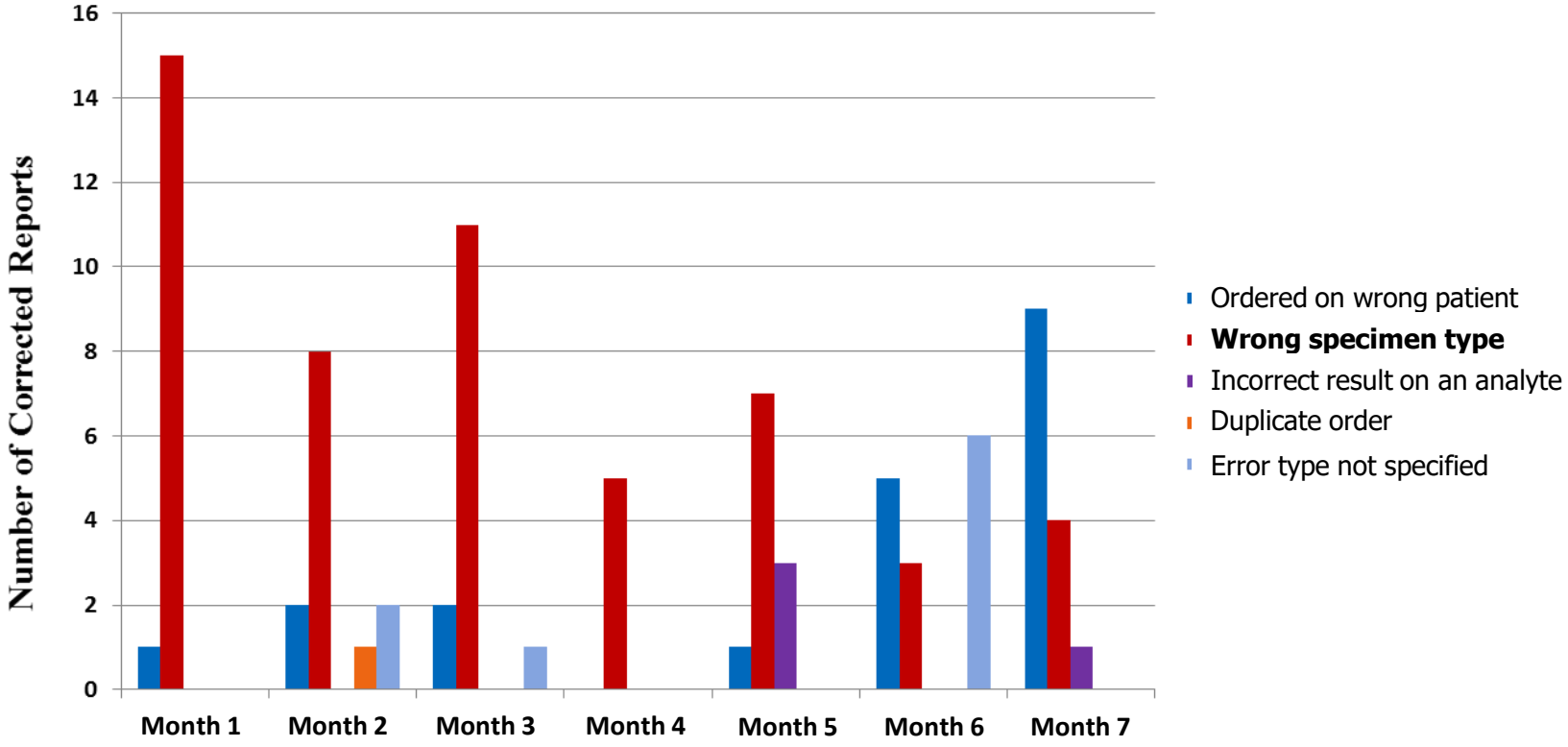
Workflow with benchtop analyzers
- Critical care units

23-27 steps
10 – 40 minutes
Variable processes

Assessment of quality – Pre-analytic errors



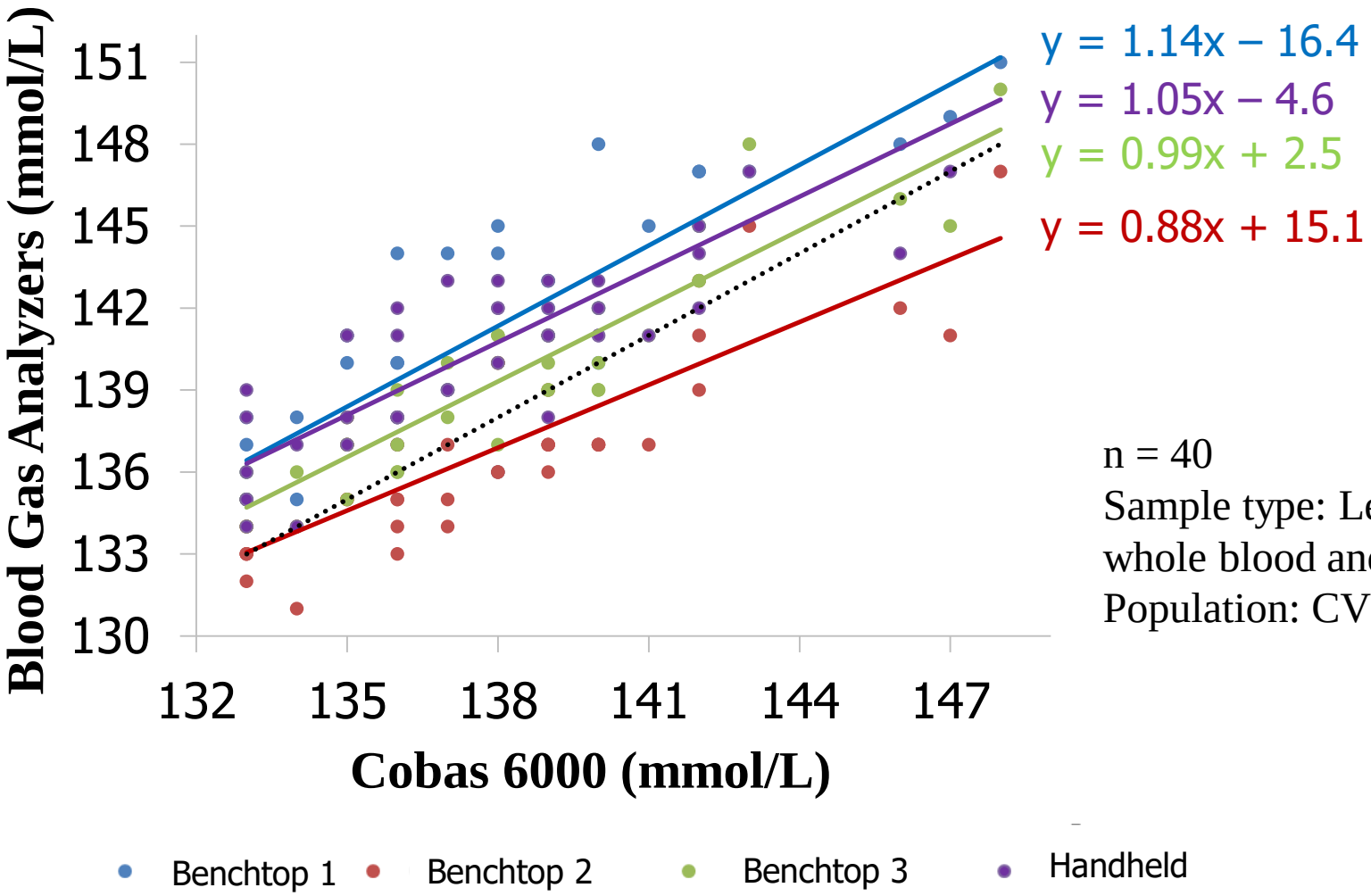
Assessment of quality – Pre-analytic errors



Assessment of Analytical Performance

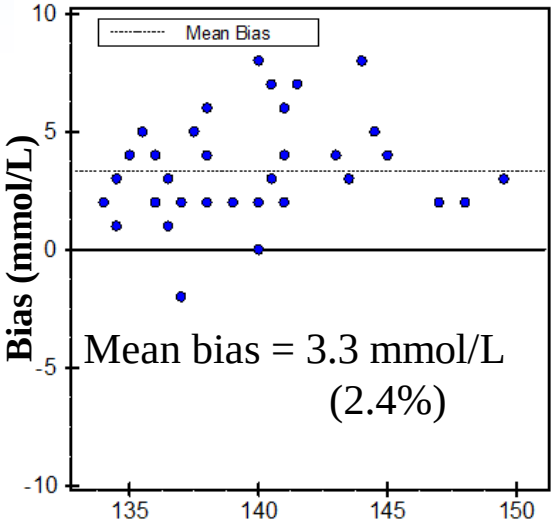
Direct measurement	Benchtops	Handheld
pH	√	√
pCO_2	√	√
PO_2	√	√
Na^+	√	√
K^+	√	√
CL^-	√	
iCa	√	√
Glu	√	√
Lac	√	√
Hct	√	√
tHb	√	
O_2Hb	√	
COHb	√	
MetHb	√	
HHb	√	
Calculated		
sO_2	√	√
HCO_3	√	√
BE	√	
TCO_2	√	√
tHb	√	√
Hct	√	

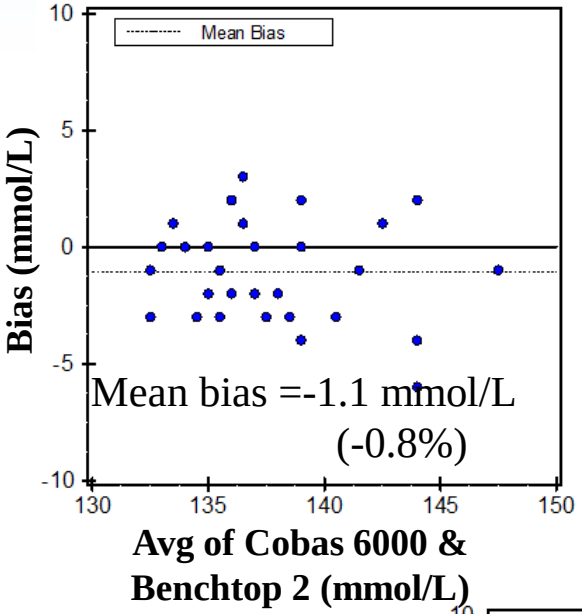
Comparison of Na Values to Laboratory Method



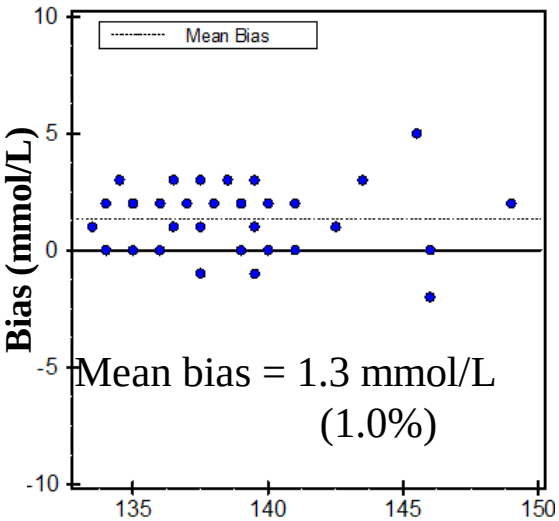
n = 40
Sample type: Leftover whole blood and serum
Population: CVS patients

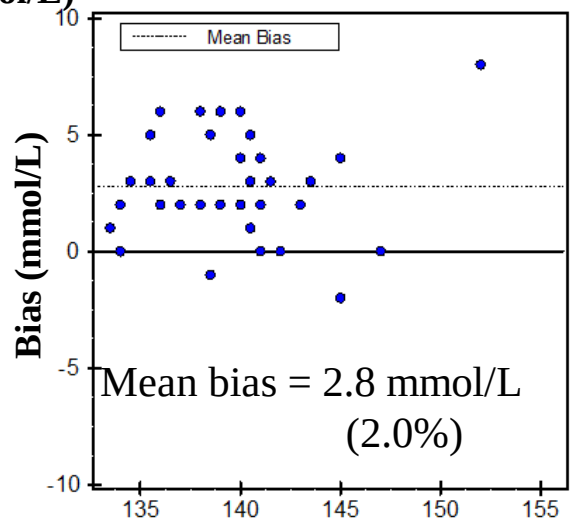
Comparison of Na Values to Laboratory Method





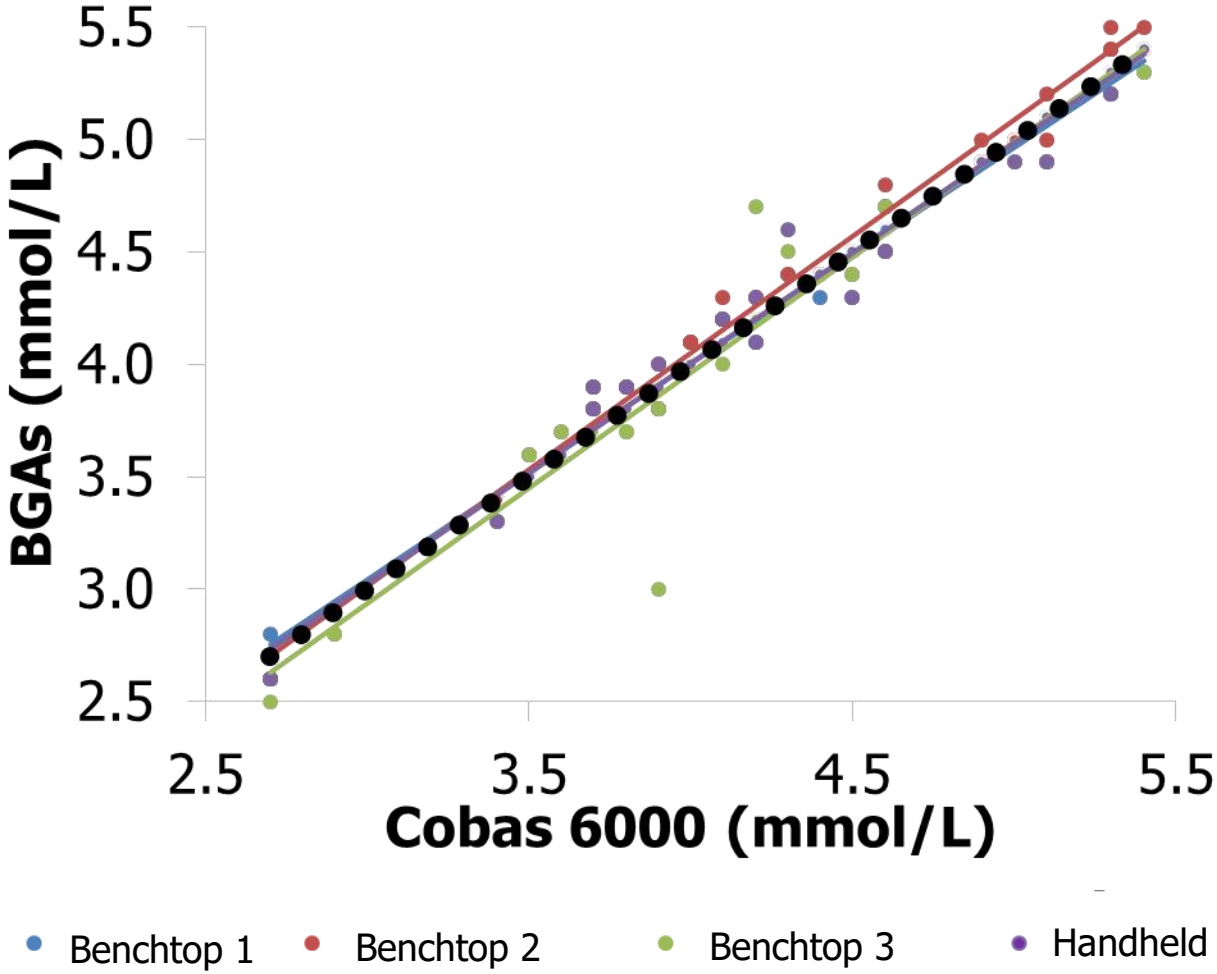
Na, allowable total error (TEa) = ± 4 mmol/L





Comparison of K values to Laboratory Method

Potassium, K



Comparison of K Values to Laboratory Method

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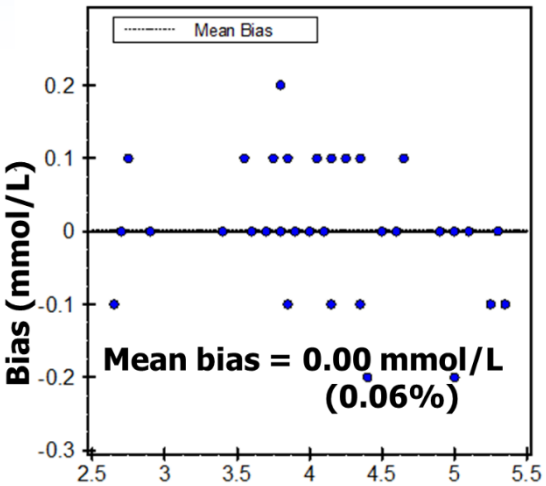
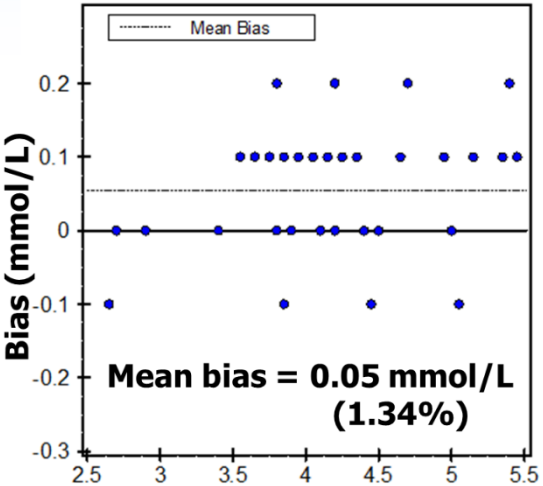
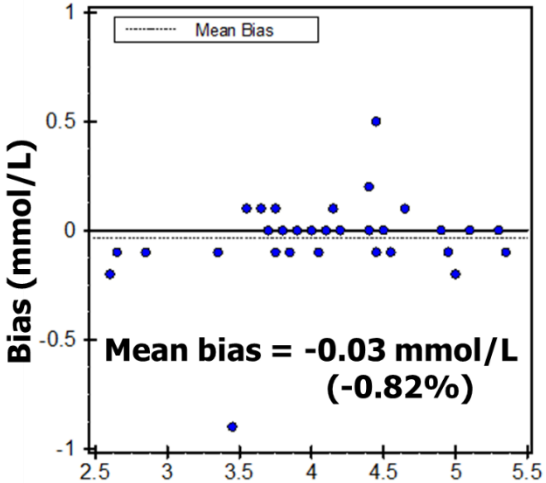


Avg of Cobas 6000 & Benchtop 1 (mmol/L)

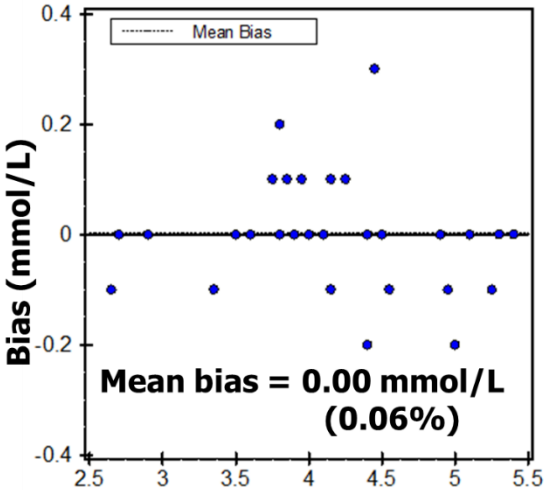


Avg of Cobas 6000 & Benchtop 2 (mmol/L)

K, allowable total error (TEa) = ± 0.05 mmol/L

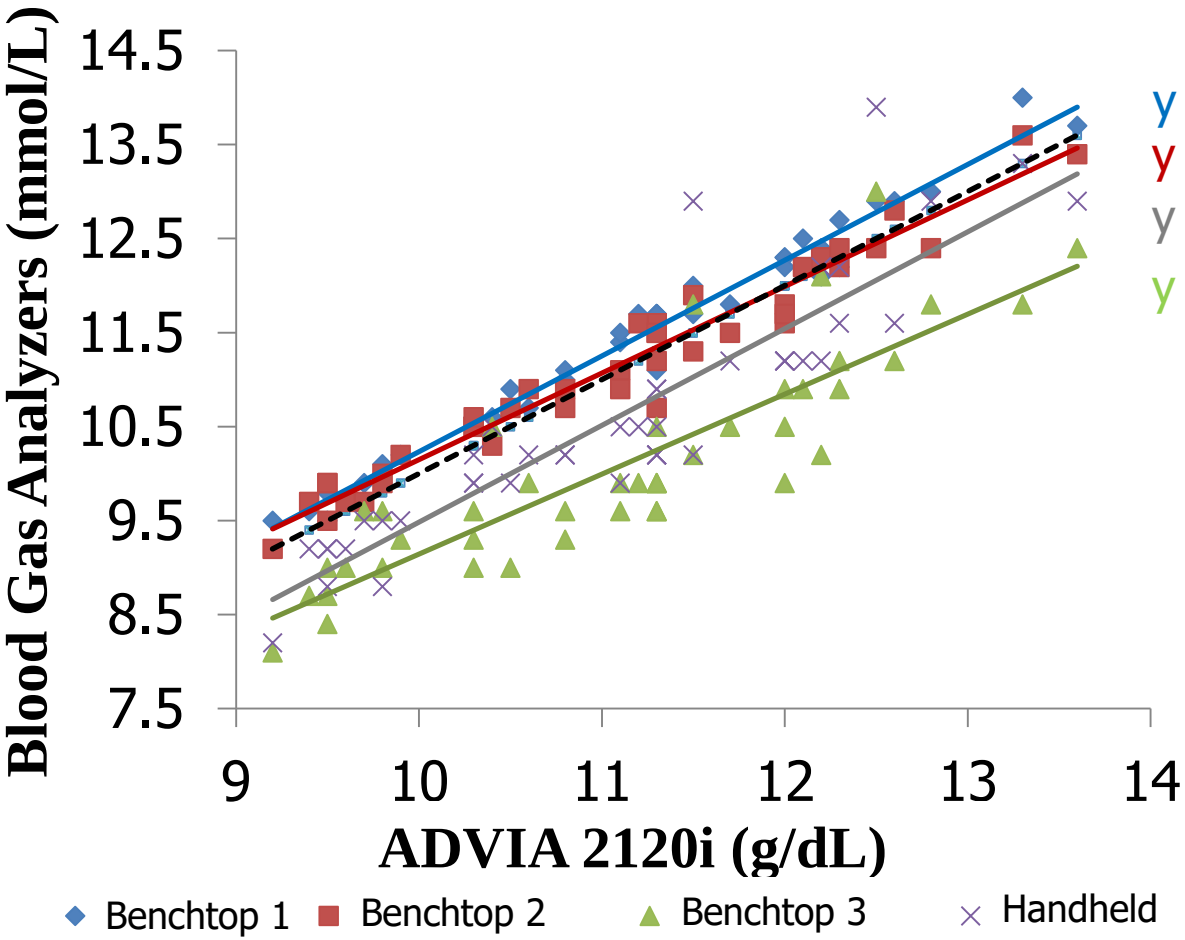


Avg of Cobas 6000 & Benchtop 3 (mmol/L)



Avg of Cobas 6000 & Handheld(mmol/L)

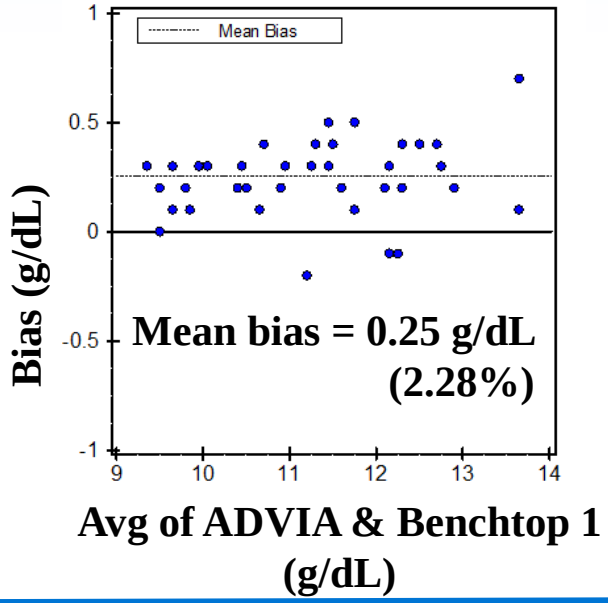
Comparison of Hb Values to Laboratory Method

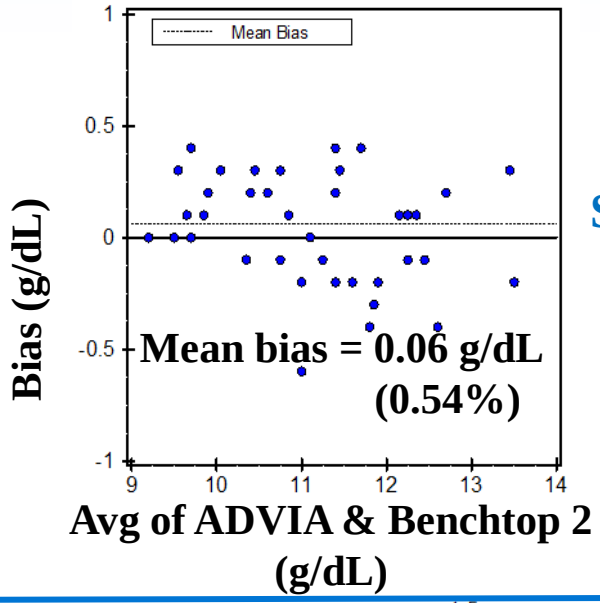


y = 1.03x – 0.08
y = 0.94x + 0.71
y = 1.16x – 2.22
y = 0.98x – 0.78

n = 40
Sample type: Leftover whole blood and serum
Population: CVS patients

Comparison of Hb Values to Laboratory Method

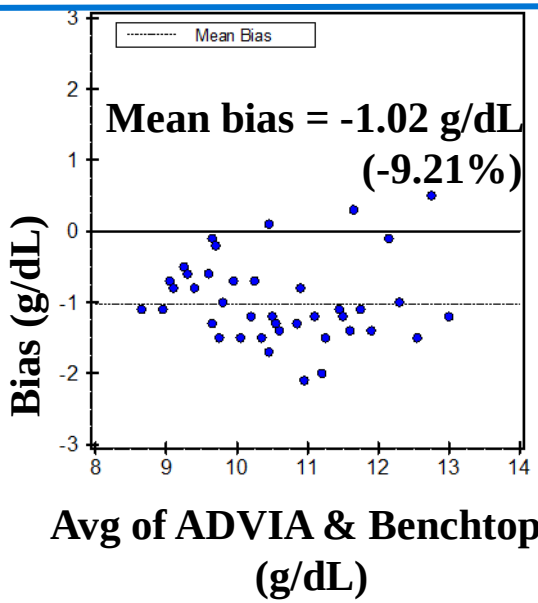


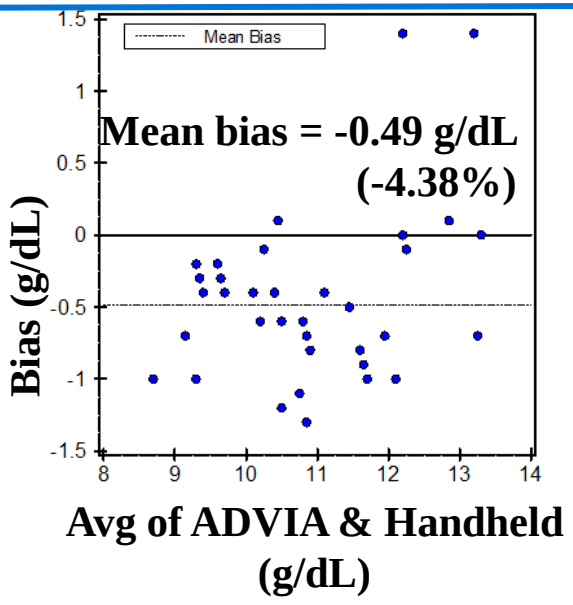


Spectrophotometry

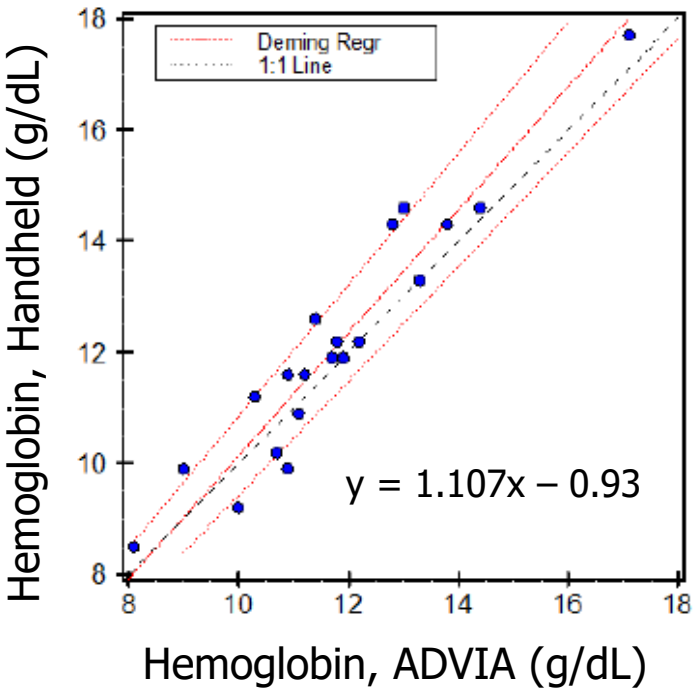
Conductivity

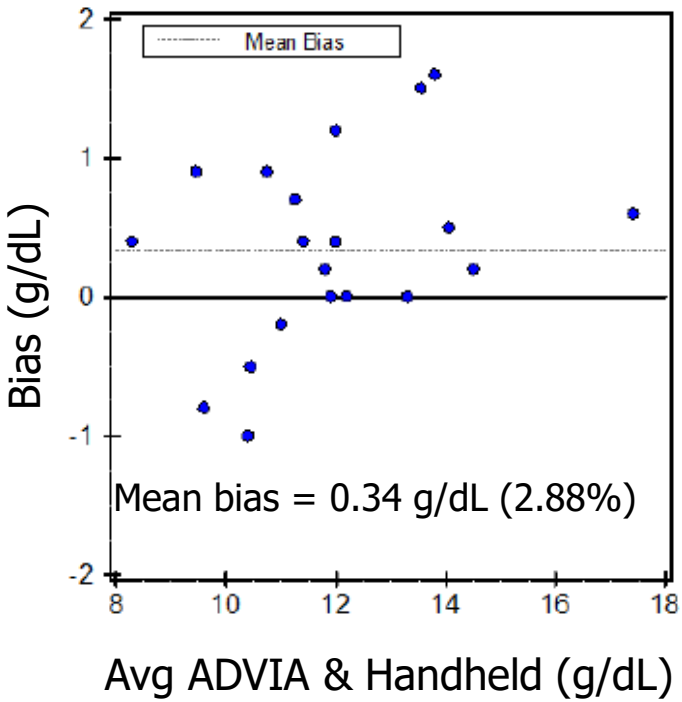
Hb TEa = ± 7%





Comparison of Hb Values to Laboratory Method



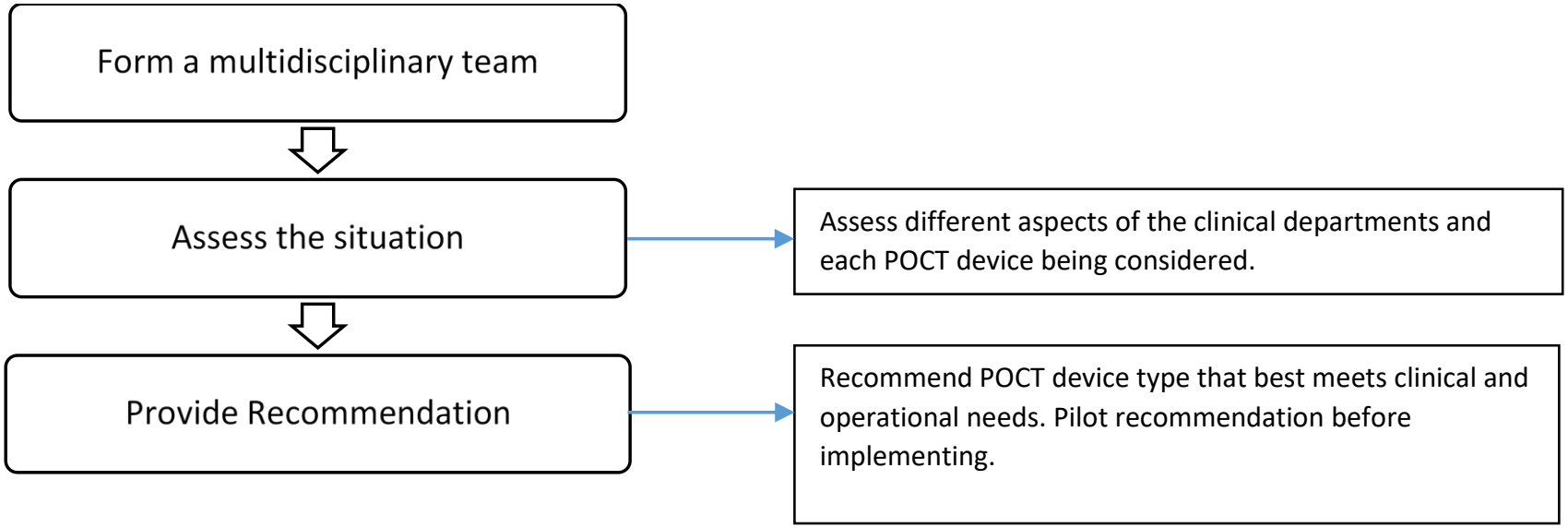


n = 21
Sample type: Leftover whole blood
Population: Samples sent to lab for routine testing

Analytical Performance Assessment Summary

Central Lab Analyzer	Blood Gas Analyzers			
	Benchtop 1	Benchtop 2	Benchtop 3	Handheld
Na	?	√	√	√
K	√	√	√	√
Hb	√	√	X	?

Key Steps in Standardizing POCT Instrumentation



Recommendation

Blood Gas Analyzer	Location
Handheld	Anesthesia/OR
	MRI
	ED/Observation
	Transport
	PICU
Benchtop 1	CICU
	NICU
	PICU
Benchtop 2	Cath Lab
Benchtop 3	CVS

Blood Gas Analyzer	Location
Handheld	Anesthesia/OR
	MRI
	ED/Observation
	Transport
	PICU
	NICU
	CICU
Benchtop 2	CICU
	NICU
	Cath Lab
	CVS

Drivers for Recommending 2 Blood Gas Analyzers

Handheld

- Near patient testing
- Improved efficiency with RT workflow
- Infrastructure already in place (Interfaced and wireless)
- PICU and NICU - Cardiac status monitoring with SO_2

Benchtop

- Need for co-oximetry
  - CCU - Patients on NO
  - NICU – Sample volume considerations
- Ease of instrument maintenance (no troubleshooting necessary)
- Cost of interfacing instruments
- Personnel satisfaction

Pilot

- PICU - 5 months
- Handheld for near patient testing
  - Performed by nurses
- Benchtop when CO-OX is needed
  - Benchtop removed from floor
  - Benchtop on alternate floor used when needed
- Widespread education of providers
  - Only results on ordered tests provided
- Separate test orders created

What Data was Collected from PICU Pilot?

- How often co-ox was tested

Percent blood gas orders with co-ox per week			
	CICU	**NICU**	**PICU**
Pre-standardization	100%	100%	100%
Post-standardization	93%	4%	0%

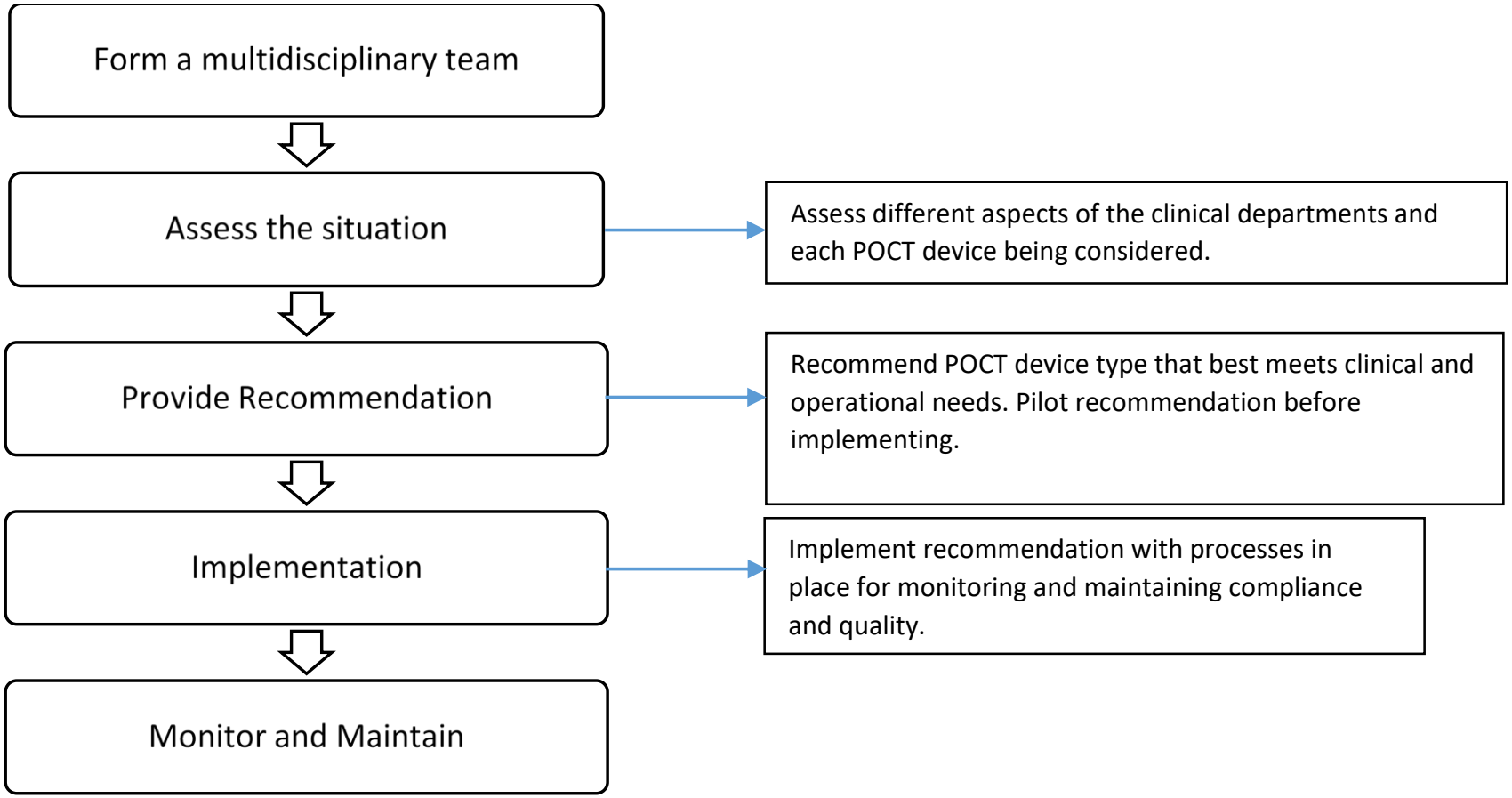
  - Significant decrease in co-ox measurements in PICU

- If benchtop needed on floor
  - None needed

What Data was Collected from Pilot?

- How many handhelds needed in each unit
  - 8/unit
- Efficiency of new workflow and concerns
  - Working relationship between nurses & RTs
- New handheld and benchtop analyzer volumes
  - New cost of supplies, instruments

Key Steps in Standardizing POCT Instrumentation



Implementation

- Provider and personnel education
- Operator training
- Sufficient instruments available for use
- Tests correctly built in the EMR and LIS
- Set go live date
  - Approved by all stakeholders
- Engage stakeholders and personnel at every step (collaborative effort)

What did we gain from standardizing?

- Improved staff efficiency
  - Increased personnel satisfaction - uniformity in practice across hospital departments
  - Increased provider satisfaction

Pre-standardization

10-40 minutes

Order placed in EMR

RN collects sample and contacts RT

RT picks up sample and walks it to blood gas lab

RT assigns accession and prints label from LIS

RT scans barcode, ~~enters patient info~~ and runs test

RT logs into different system, links EMR orders to LIS accession

RT enters test results into LIS

RT double checks correct results in EMR

RT prints results and walks them to provider

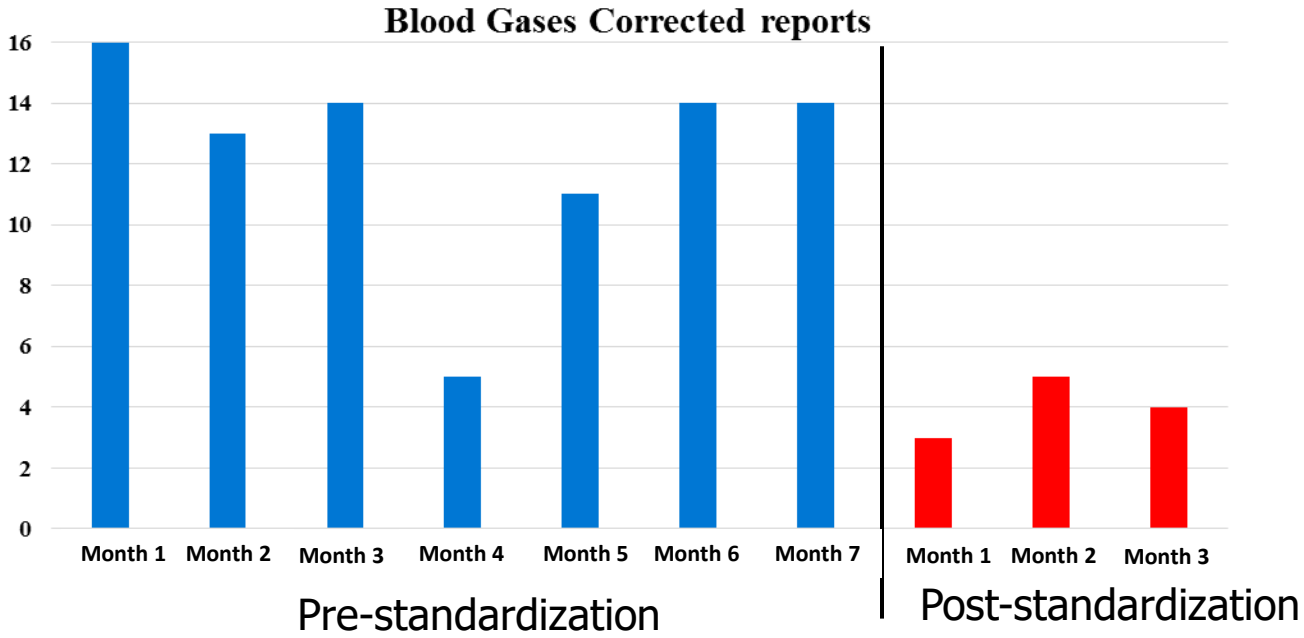
Post-standardization

<5 minutes

"…this is POCT at its best…"

What did we gain from standardizing?

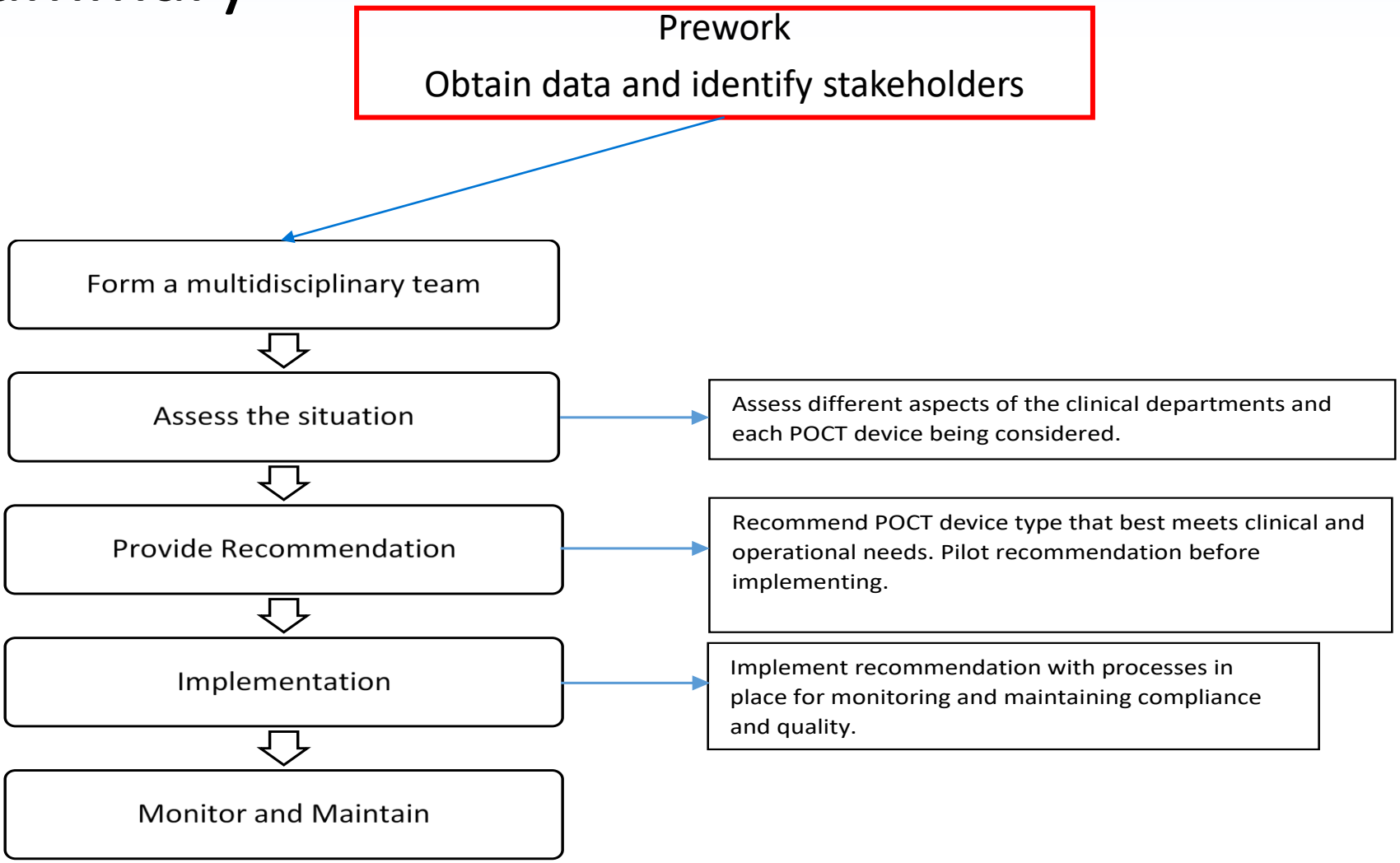
- Improved quality
  - Decreased pre-analytic errors – fewer corrected reports
  - Increased regulatory compliance
  - Improved test utilization
  - All standardized POC instruments interfaced to the EMR



What did we gain from standardizing?

- Cost savings
  - More efficient workflows for personnel
  - Decreased supply expenses due to increased test volume
  - Decreased maintenance and data management costs
    - Fewer vendor fees – eliminated one vendor fee
  - Department reached goal for sustainable savings initiative

Summary



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https://www.aacc.org/community/aacc-academy/publications/scientific-shorts/2018/is-standardizing-poct-instrumentation-worth-the-challenge

Are you up for the challenge of standardizing your POC instrumentation?

A. Yes
B. No

Questions?